



Cartography and Imaging
Sciences Node

Jet Propulsion Laboratory

U.S. Geological Survey

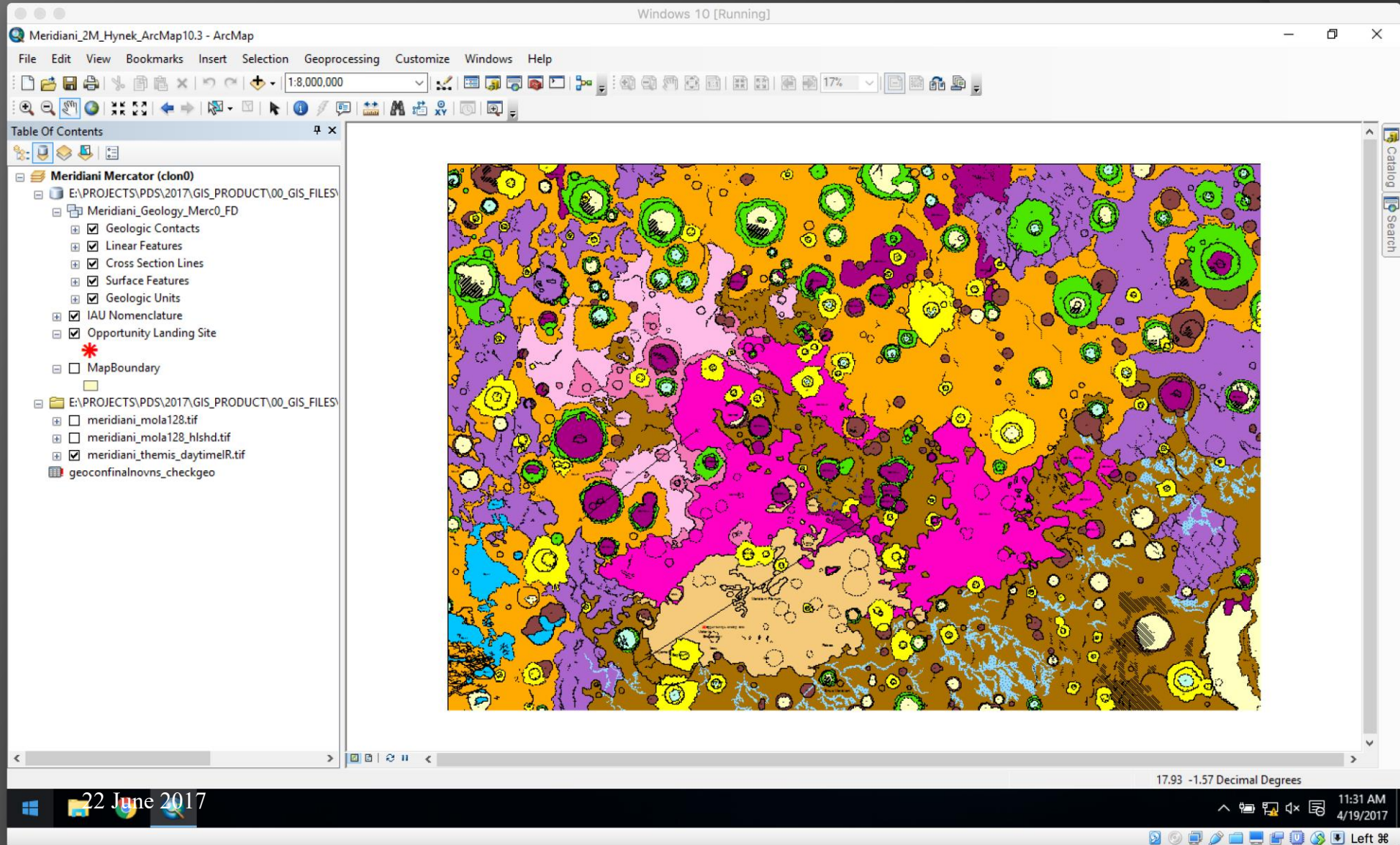
Archiving of GIS Products in PDS4

Moses Milazzo

PDS IMG: USGS, Astrogeology

Planetary Data Workshop III; 14 June 2017

A Recap: What is GIS?



A Recap: What is GIS?



- ⦿ **Geographic Information System is a system capable of capturing, storing, displaying, analyzing geographically referenced information.**
- ⦿ **GIS's power is that it provides a way to relate different information in a spatial context and to allow scientists to reach conclusions about the relationships.**
- ⦿ **GIS is a framework for the “Science of Where.”**

What does GIS provide?



- ⦿ Complex analysis is enabled
 - **Information retrieval of all data at a specific location**
 - Topology, Adjacency, Containment, Proximity, Networks, Overlays, ...
- ⦿ Re-Use
 - Derived data can be re-incorporated into the GIS so inferences from the derived data can contribute to further analysis of the original data.
- ⦿ Cooperation
 - GIS provides a common interface and standards.
 - Planetary data collection, organization, and analysis is expensive.
 - **GIS allows to share.**

What is GML?

- **Geography Markup Language** is the XML grammar defined by the Open Geospatial Consortium (OGC) to express geographical features in a GIS.
- GML is a modeling language for GIS
- GML is an open interchange format for GIS software applications.

What is GML?



- ◉ GML primitives include:
 - Geometry
 - Feature
 - Coordinate Reference System
 - Topology
 - Time
 - Dynamic feature
 - Coverage
 - Unit of measure
 - Direction
 - Observations
 - Map presentation styling rules

What is GML?

- GML is an ISO standard for GIS data (ISO 19136 for GML 3.2.1, approved in 2007)
- An OGC standard for GIS use (GML 3.2.1)
- Approved by the Library of Congress for archival of GIS products
- Used by the Federal Geographic Data Consortium (FGDC) and National Spatial Data Infrastructure (NSDI).

Why GML for PDS4?



- GIS products are being delivered to USGS regularly. We “archive” these in the Annex and also archive full geological maps with the USGS.
- GML is a standard and stable language for GIS storage, interchange, and implementation.
- It is supported by all major and many minor GIS packages, including Free and Open software.
- The FGDC/NSDI have implemented a GML Application Schema.

Why *NOT* GML for PDS4?

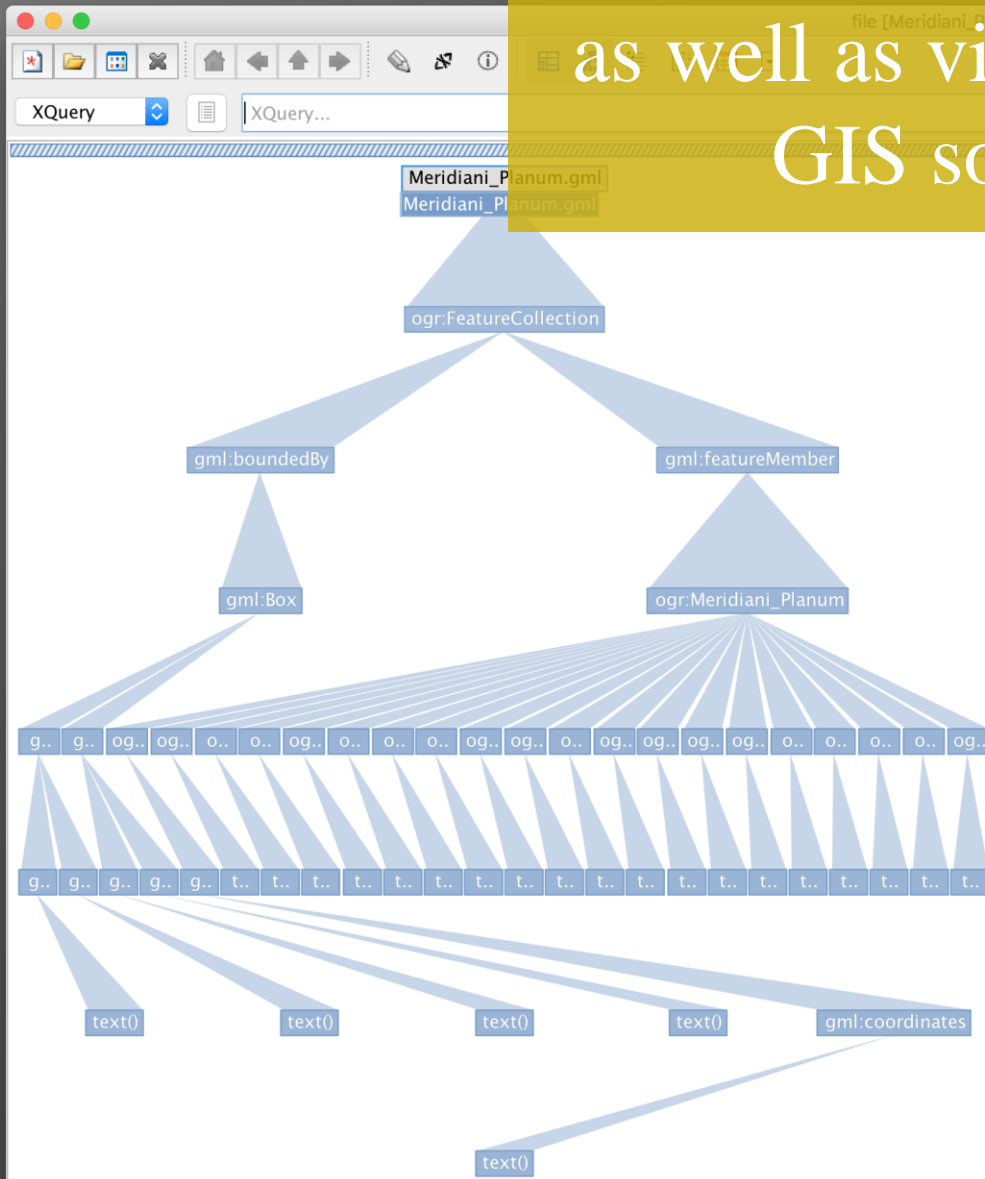
- ARCInfo Shapefiles are in common use.
- Shapefiles are also a standard interchange format.
- The Shapefile format is an “open” (but proprietary and binary) format.
- Shapefiles are supported by all major and minor GIS packages as well as most vector layer visualization software.
- Shapefiles are easier to generate for most users.
- USGS Astrogeology already “archives” ARC projects.

Why *NOT* ARC for PDS4?



- ⦿ Astrogeology ARCGIS project archives are not yet fully compliant deep archives.
- ⦿ Projects archived with USGS are not searchable within the context of the PDS.
 - Missing important metadata.
- ⦿ Shapefiles are a proprietary format.
 - Community has little control over the future of shapefile format decisions.

GML XML files can be explored with existing tools as well as visualized with GIS software.



file [Meridiani_Planum] - BaseX 3.6.2

0 Results

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gml:featureMember			
ogr:Meridiani_Planum			
ogr:geometryProperty	ogr:clean_name	ogr:approval	ogr:min_lat
gml:Point	Meridiani Planum	Adopted by IAU	-3.99976158142
gml:coordinates			
-3.247071214102448			
, -0.888975805506334			
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ogr:name	ogr:origin	ogr:max_lon	ogr:ethnicity
Meridiani Planum	Classical albedo feature name.	360.00000190700	Latin
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		ogr:code	
		PM	
ogr:center_lat		ogr:continent	ogr:quad_...
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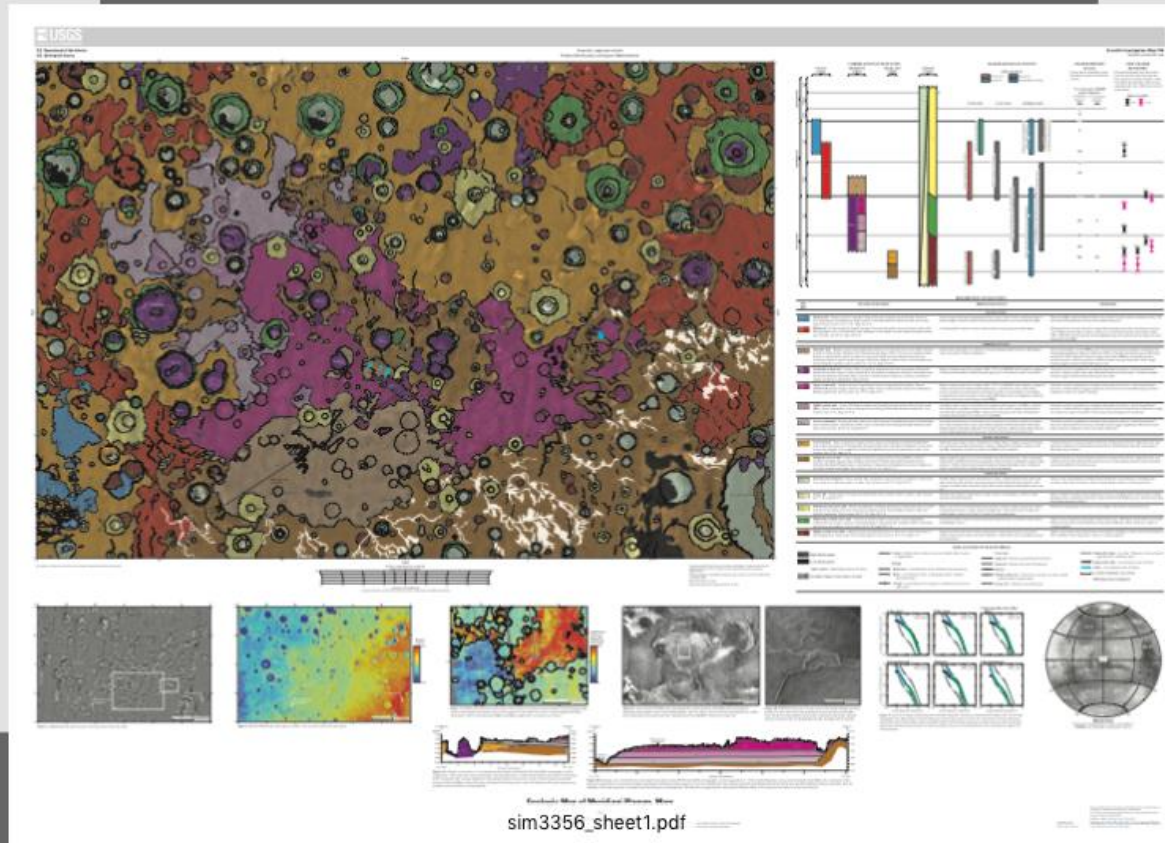
PDF document and browse products can easily be viewed with existing tools.

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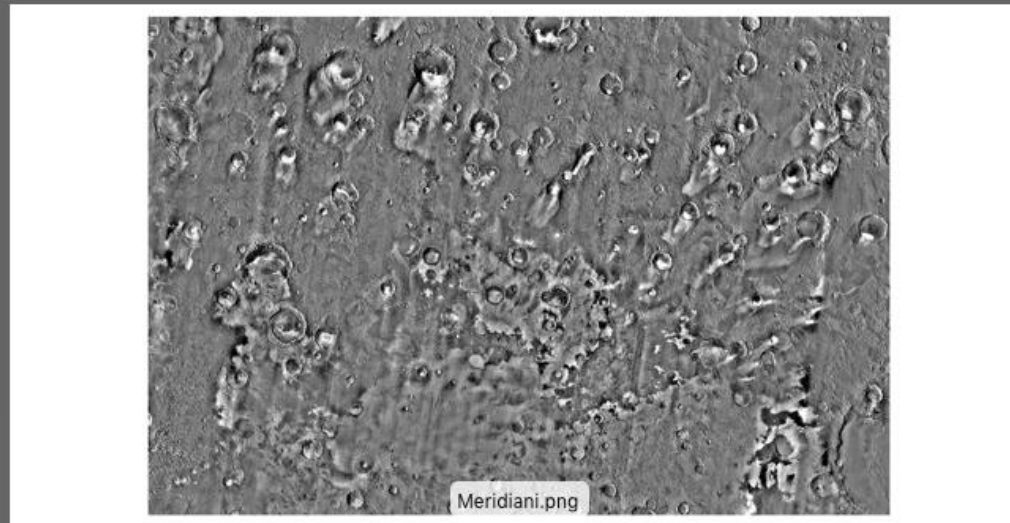
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.DS_Store	Today, 4:31 PM	6 KB	Document
▼ browse	Today, 2:34 PM	--	Folder
.DS_Store	Today, 2:34 PM	6 KB	Document
Collection_browse_inventory.tab	Oct 3, 2016, 7:48 AM	71 bytes	Document
Collection_browse.xml	Oct 3, 2016, 7:48 AM	8 KB	XML Source File
sim3356_pamphlet.pdf	Apr 10, 2017, 12:18 PM	613 KB	PDF Document

Raster layers can easily be viewed with PDS4 viewer tools.



Name	Date Modified	Size	Kind
.DS_Store	Today, 4:28 PM	6 KB	Document
.layers	Today, 4:28 PM	--	Folder
.prj	Today, 3:08 PM	--	Folder
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Collection_data.xml	Oct 3, 2016, 7:48 AM	8 KB	XML Source File
lineament.gml	Yesterday, 2:25 PM	31 KB	GML document
Marth.gml	Yesterday, 2:25 PM	2 KB	GML document
Mellit.gml	Yesterday, 2:25 PM	2 KB	GML document
Meridiani_Planum.gml.017	Yesterday, 2:25 PM	2 KB	GML document
meridiani_themis_daytimeIR.tif	Yesterday, 2:19 PM	428.4 MB	TIFF image
meridiani_themis_daytimeIR.tif.aux.xml	Today, 4:37 PM	2 KB	XML Source File

Other files conform to PDS4 Standards



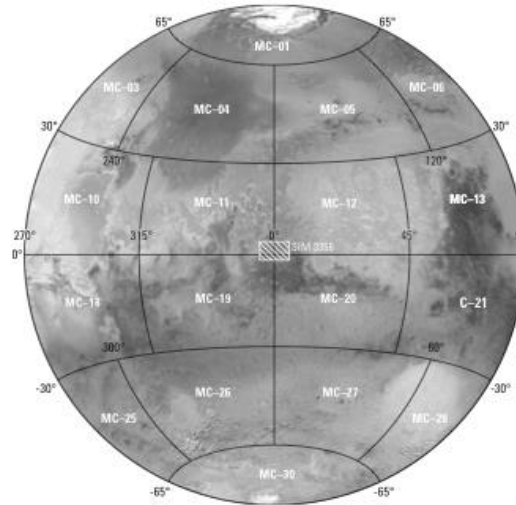
Prepared for the National Aeronautics and Space Administration

Geologic Map of Meridiani Planum, Mars

By Brian M. Hynek and Gaetano Di Achille

Pamphlet to accompany

Scientific Investigations Map 3356



2017

U.S. Department of the Interior
U.S. Geological Survey

sim3356_pamphlet.pdf

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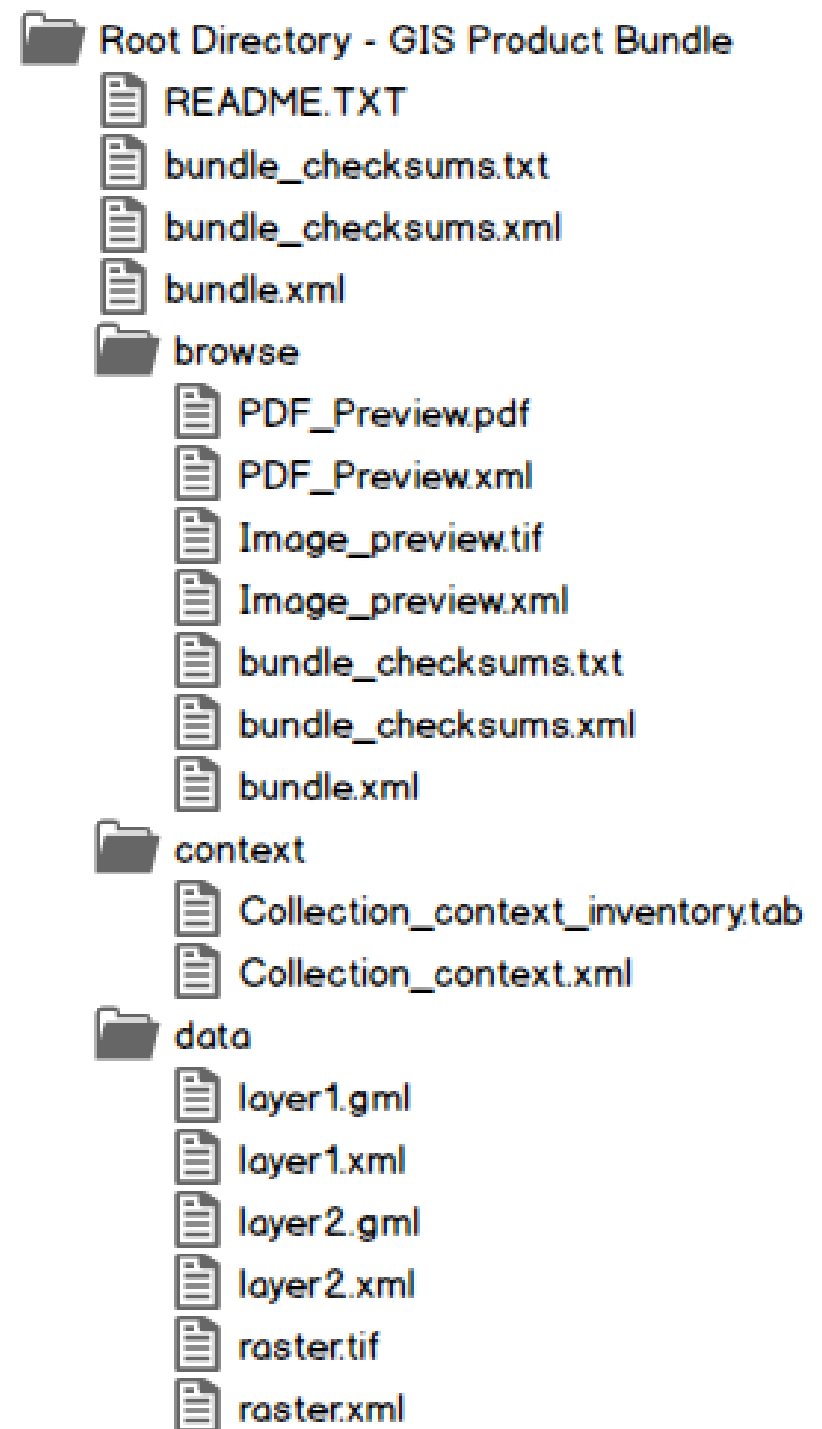
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.DS_Store	Today, 2:34 PM	6 KB	Document
Collection_browse_inventory.tab	Oct 3, 2016, 7:48 AM	71 bytes	Document

**Most layers will be GML files
(text; XML).**

**Basemaps and other raster
images can be PDS4-
compliant images.**



Browse products can be IMG
or PDF format.

Document products (project
description, published papers,
published map, etc.) can be text
or PDF.

